Catalogue of American Amphibians and Reptiles.

BROWN, LAUREN E. 1973. *Bufo houstonensis.*

Bufo houstonensis Sanders
Houston toad

Bufo terrestris: Harwood, 1932:57 (part).
Bufo americanus: Wright and Wright, 1938:20 (part).
Bufo houstonensis Sanders, 1953:27. Type-locality, "Fairbanks, Harris Co., Texas" [more specifically: "off Tanner Road, 1-2 mi. W of its junction with Campbell Road" in northwest Houston—see Brown, 1971]. Holotype, University of Illinois Mus. Nat. Hist. 33687, adult female, collected by John C. Wottring and Walter J. Greer, 18 May 1952 (examined by author).
Bufo americanus houstonensis: A. P. Blair, 1957:250. Subspecific status suggested.

• CONTENT. No subspecies have been described.

• DEFINITION. A member of the *Bufo americanus* species group (W. F. Blair, 1963; Tihen, 1962) with snout-vent lengths of sexually mature preserved specimens ranging 49–66 mm for males and 57–80 mm for females; parotoid glands elongated but otherwise highly variable in configuration; parotoid surface heavily pitted, with one or more dark spots and usually small warts; parotoid glands in contact with only the posterior ends of the short preparotoid cranial crests, or, less frequently, adjacent to the postocular cranial crests; parietal cranial crests reduced, not enlarged into bosses; postocular crests often thickened; dorsal surface of body very warty, many small warts between larger warts; one-five larger warts per dorsal spot (most frequently one-three warts per spot); dorsal spots lacking accentuated borders; medial, external surface of upper jaw with dark spots; ventral spotting confined to small dark spots in the pectoral region and sometimes on the throat.

• DESCRIPTIONS. Sanders (1953) provided descriptions of adults (based on the type series) and eggs; he paid particular attention to cranial osteology. The larval and juvenile stages have not been described.

The mating call is a long, high-pitched trill (Brown, 1967, 1971; W. F. Blair, 1956). Some mating call characteristics of 38 individuals (air temperature range = 4.5–24.0°C; water temperature range = 14.5–23.0°C) are summarized as follows: mean call duration = 14.2 sec (range = 7.3–22.2 sec); mean dominant frequency = 1980 cps (range = 1646–2300 cps); mean pulse rate = 24.6 pulses per sec (range = 14–36 pulses per sec).

• ILLUSTRATIONS. The best photographs available are Kennedy's (1962) dorsolateral views of live male and female specimens from Houston. Sanders (1953) presented photographs of the preserved holotype and a male paratype (dorsal views), a photograph of the eggs, a photograph (dorsal view) of the skull and anterior portion of the vertebral column, a diagrammatic lateral view of the skull, and a drawing of the temporal plate and part of the squamosal bone. Brown (1971) included a photograph (dorsal view) of a preserved male from the Bastrop population. The shapes of the cranial crests and parotoid glands are emphasized in a drawing of the dorsal aspect of the head region in Conant (1958). Photographs of the karyotype are presented by Bogart (1968; 1972).

• DISTRIBUTION. Nine relictual populations have been reported in central and southeastern Texas (Sanders, 1953; W. F. Blair, 1956; Brown, 1971). Most of these localities have sandy soil which seems to be a factor limiting the distribution of the species (Brown, 1971; Kennedy, 1962). The populations are also often located in or near pine forests, and population sizes seem very small at most localities (Brown, 1971).

• FOSSIL RECORD. None.

• PERTINENT LITERATURE. Kennedy (1962) gave details on the spawning season and site in Houston. He also found that a female laid 728 eggs. Habitat, breeding season, trend toward extinction, isolating mechanisms and other aspects of the ecology were covered by Brown (1971). Bragg (1960) found *B. houstonensis* to be a more discriminate feeder than certain other bufonid species and observed that *B. houstonensis* was a poor burrower in compact soil. The external morphology and time of initial appearance of the parotoid gland in newly metamorphosed specimens were studied by Licht (1967a). Licht (1967b) noted that *B. houstonensis* larvae raised in water previously conditioned by a large number of larval *Bufo woodhousii* showed inhibited growth. This effect was not evident when *B. houstonensis* larvae were exposed to water conditioned by larval *Bufo speciosus.*

Natural hybridization of *B. houstonensis* with *B. woodhousii* and *Bufo valliceps* at the Bastrop locality was investigated by Brown (1971), who considered habitat destruction the main cause of the natural hybridization. Male *B. houstonensis* × *B. woodhousii* natural hybrids (fertile) were difficult to distinguish morphologically from either parental species but had mating calls with intermediate pulse rates, dominant frequencies and durations (Brown, 1971), as well as intermediate release vibration pulse rates (Brown and Littlejohn, 1972). Male *B. houstonensis* × *B. valliceps* natural hybrids (sterile) were morphologically intermediate but had mating calls that were abnormal and not always intermediate between the parental species (Brown, 1971). Both types of natural hybrids had transferrins and hemoglobins characteristic of their parental species (Guttman, 1969; 1972). The calling behavior of a captive male *B. houstonensis* × *B. woodhousii* natural hybrid was commented on by Brown (1971).

Results of laboratory hybridizations between *B. houstonensis* and other species of *Bufo* were reported by W. F. Blair (1959; 1972a) and Kennedy (1962). Bogart (1972) investigated the karyotypes of various laboratory produced hybrids that had *B. houstonensis* as one parent. The mating call of

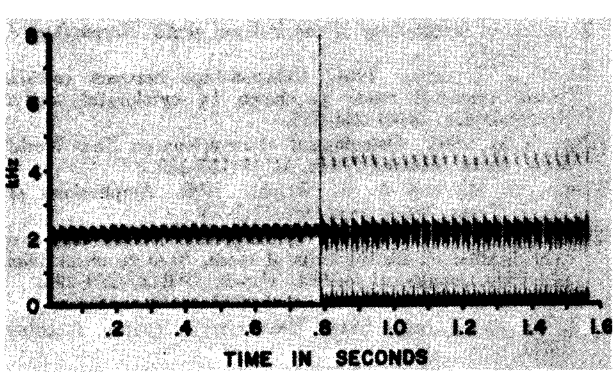
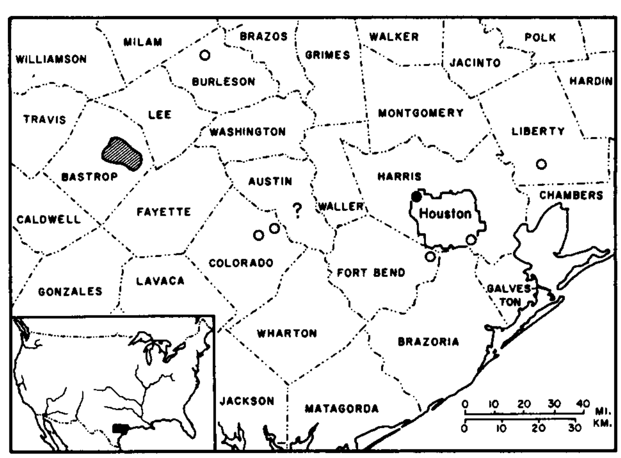


FIGURE. Audiospectrogram (narrow band, 45 Hz on left; wide band, 300 Hz on right) of part of the mating call of *Bufo houstonensis*: Bastrop County, Texas, 7 April 1965, throat 23°C, air 23.5°C, water 22.0°C (L. E. Brown recording).



MAP. Solid circle marks the type-locality; shaded area represents the more extensive Bastrop population; question mark indicates that the exact locality is unknown; open circles indicate other records.

a male *B. terrestris* × *B. houstonensis* laboratory produced hybrid had a pulse rate intermediate between the mating calls of the parental species (W. F. Blair, 1958a). Photographs are available for adults of three hybrid combinations: *B. houstonensis* × *B. woodhousii* (Brown, 1971); *B. houstonensis* × *B. valliceps* (Brown, 1971; Kennedy, 1962); *B. terrestris* × *B. houstonensis* (W. F. Blair, 1959).

The first report on the karyotype of *B. houstonensis* (Sanders and Cross, 1964) erroneously gave the chromosome number as 2N = 21 and listed four chromosomes as being acrocentric. Subsequently, Bogart (1968) demonstrated the presence of 22 chromosomes, none of which was acrocentric. A further examination carried out by Bogart (1972) included an ideogram of the karyotype. Electrophoretic studies on transferrins, hemoglobins and other blood proteins were carried out by Guttman (1967, 1969, 1972). Transferrin analyses suggested that introgression may have occurred between *B. houstonensis* and *B. woodhousii*. The single hemoglobin band of *B. houstonensis* was the slowest moving in the *B. americanus* species group.

Brown and Littlejohn (1972) presented an analysis of the release call (effects of temperature on release call; comparison of release chirp and release vibration; comparison of release call and mating call; comparison of the release calls of *B. houstonensis* and other members of the *B. americanus* species group). The structure of the vocal apparatus and mechanics of sound production have been dealt with by McAlister (1959) and W. F. Martin (1967). The skull of *B. houstonensis* was compared with those of *B. americanus* and *B. terrestris* by Sanders (1953). One male *B. houstonensis* examined by W. F. Blair (1972b) had elongated testes with a width to length ratio of 7 per cent which was considerably below that of other members of the *B. americanus* species group. Helminth parasites were examined by Harwood (1932). Phylogenetic relationships and evolutionary history were treated by W. F. Blair (1958b; 1963), Bogart (1972), Brown and Littlejohn (1972), R. F. Martin (1964), W. F. Martin (1967) and Thien (1962). In December 1968 *B. houstonensis* was entered in the "Redbook" of rare and endangered species (Peters, 1968).

• Etymology. The species was named after the city of Houston, Texas, where the holotype was collected.

Comment

In light of the suggested close affinities of *B. houstonensis* and *B. americanus* (A. P. Blair, 1957; W. F. Blair, 1963; Bogart, 1972; Brown and Littlejohn, 1972), it is pertinent to compare characteristics of mating calls of *B. houstonensis* recorded by Brown (1967) with mating call characteristics of *B. americanus* (Northvale, N. J.) predicted from the equations of Zweifel (1968). Mating call characteristics for eleven *B. houstonensis* (mean air temperature = 22.64°C, range = 20.0–24.0°C; mean water temperature = 22.06°C, range = 21.5–23.0°C) are summarized as follows: mean pulse rate = 32.2 pulses per sec (range = 30–36 pulses per sec); mean call duration = 9.9 sec (range = 7.7–14.7 sec); mean dominant frequency = 2068 cps (range = 1857–2280 cps). At 22.35°C *B. americanus* has a predicted value for the mating call pulse rate of 48.3 pulses per sec and a value for the call duration of 5.7 sec. The dominant frequency range for *B. americanus* reported by Zweifel (1968) was 1400–1900 cps. Because of the importance of the mating call in premating reproductive isolation in anurans, and because of the considerable differences in the mating calls of *B. houstonensis* and *B. americanus* (particularly in pulse rates), it would seem that A. P. Blair's (1957) relegation of *B. houstonensis* to subspecific status under *B. americanus* (unsupported by data) is unjustified.

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